

## FISH LAKE



### Introduction

Fish Lake is the largest natural mountain lake in Utah. It is on the Fish Lake Plateau (the sixth highest mountains in the state), in central Utah. It is a natural body of water in a deep, wide graben valley. It is accessible by a paved state highway and has many recreational developments on its north shore. This lake should not be confused with several other lakes of the same name, including one in the

Uintas. In 1935 A dam was built to regulate the release of water from the lake. Water level can only be lowered three feet, so the lake remains essentially in its natural state. The reservoir shoreline is publicly owned and administered by the Fish Lake National Forest with unrestricted public access. The top 3' of water is drawn off for agricultural uses. Water is used for coldwater aquatic habitat and recreation. No changes in water use are anticipated.

#### Characteristics and Morphometry

Lake elevation (meters / feet)	2,695 / 8,843
Surface area (hectares / acres)	1,012 / 2,500
Watershed area (hectares / acres)	4,662 / 11,520
Volume (m <sup>3</sup> / acre-feet)	265,095,000 / 212,500
Annual inflow (m <sup>3</sup> / acre-feet)	
Retention time (years)	58.5
Mean annual vertical fluctuation (meters / feet)	1 / 3
Depth (meters / feet)	
maximum	53.3 / 174.8
mean	25.9 / 84.9
Length (km / miles)	8.6 / 5.3
Width (km / miles)	1.8 / 1.1
Shoreline (km / miles)	19.8 / 12.3

#### Location

County	Sevier
Longitude / Latitude	111 42 15 / 38 32 45
USGS Map	Fish Lake, Utah, 1968
DeLorme Atlas	Page 27, A-6
Cataloging Unit	Fremont River (14070003)

### Recreation

Fish Lake is easily accessed from U-25, which runs from U-24 (between Salina and Loa) to Fish Lake. Fishing, boating, scuba diving, waterskiing, cross

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country skiing, and swimming are possible in the area. Usage is heavy, but scenery and recreational opportunities are outstanding.

Recreational facilities consist of public and private campgrounds, housekeeping cottages, improved boat ramps, boat rental and picnic grounds.

USFS campgrounds include Doctor Creek (29 family sites and 2 group sites), Mackinaw (53 family sites and 15 group sites) and Bowery (31 family sites and 12 group sites). All have flush toilets and have fees for use.



Private resorts include Bowery Haven and Fish Lake Lodge/Lakeside Resort. Both offer boat rentals, launching ramps, rustic and modern cabins, groceries, gas, RV park facilities, and campgrounds. Bowery Haven also has an eight room motel and a cafe. Nightly rates are about \$10 for tent or RV camping, \$30 - 60 for housekeeping cabins, and >\$100 for large cabins. Reservations should be made several months in advance.



### Watershed Description

The lake is in an area of high, rolling ridges and wide valleys characteristic of the top of the Fish Lake Plateau. The lake lies in a graben valley, where the valley floor has sunk beneath the sides. In this instance, the valley is sinking faster than erosion fills it with sediment, resulting in a natural impoundment.

The lake area/watershed area ratio is very high, with the lake occupying about 20% of the watershed. The high ratio results in a long retention time and relatively little deposition of sediments. Other grabens on the Fish Lake/Wasatch Plateaus have been filled with sediments and do not have natural lakes.

One mile east of the lake are Crater Lakes, two natural lakes with no surface drainage. Their origin is similar to Fish Lake's, but they are in small depressions and have no watershed beyond the depressions themselves.

Aspen and coniferous forests cover the mountains around the reservoir. Some of these forests have been cleared for land development and road construction, but they are largely intact. The higher elevations have alpine vegetation.

The Fish Lake Hightop Plateau, immediately north of the lake, is the highest of the high plateaus of southern Utah. A point on the south shoulder, at 3,545 m (11,500 ft) is the watershed high point, thereby developing a complex slope of 12.5% to the reservoir. The average stream gradient above the reservoir is 10.5% (555 feet per

mile). The inflows are Jorgenson Creek, Bowery Creek, Twin Creek, and Doctor Creek. The outlet is Lake Creek, a headwater stream of the Fremont River.

The watershed is composed of high mountains and the graben valley. The soil is largely of volcanic origin with moderate permeability and moderately slow erosion and runoff. Soil associations are listed in Appendix III.

The vegetation communities are comprised of pine, aspen, spruce-fir, oak and maple. The watershed receives 41 - 76 cm (16 - 30 inches) of precipitation annually with a frost-free season of 60 - 80 days at the reservoir.

### Limnological Assessment

The water quality of Fish Lake is very good. It is considered soft water with a hardness concentration of approximately 46 mg/L (CaCO<sub>3</sub>). The only parameter that exceeds State standards is phosphorus. All other parameters including total metals obtained near the bottom at the deep sites were within State standards for defined beneficial uses. Generally total phosphorus levels have not exceeded the State pollution indicator for phosphorus of 25 ug/L. However, in 1989 total phosphorus values exceeded the indicator throughout the water column. Phosphorus concentrations averaged 34.3 ug/L at the surface and a value of 229 ug/L was reported near the bottom. These relatively high values reported near the bottom did skew the data and a typically oligotrophic reservoir was reported as mesotrophic during that period of the study. Nutrients throughout the water column are typically not a problem. However it should be noted that during this period of sampling anoxic conditions were resented near the bottom (August 22, 1989) of the reservoir as again depicted by the August 22, 1991 profile. Anoxic conditions permit the reintroduction of phosphorus stored in the sediments back into the water column. In addition when sampling near the bottom on occasion, the sample may contain suspended bottom materials the give a erroneous high value. As indicated in the profiles for the lake, it does stratify and anoxic conditions do develop near the bottom of the lake. Data throughout the study period indicates that the lake is nitrogen limited with N/P ratios near 1-2. As indicated in the lake profile, stratification does occur at approximated 9-10 meters, but dissolved oxygen concentrations are fairly high throughout the water column. The exceptions ins near the bottom. Although the lake was reported as barely mesotrophic in 1989, it appears that the trophic status for the lake is essentially oligotrophic. According to DWR stocking records subcatchable or advanced rainbow trout (*Oncorhynchus mykiss*), lake trout (*Salvelinus namaycush*), and splake, a cross of brook and lake trout (*Salvelinus fontinalis* X *Salvelinus namaycush*) and fingerling brook trout (*Salvelinus fontinalis*) have been introduced to

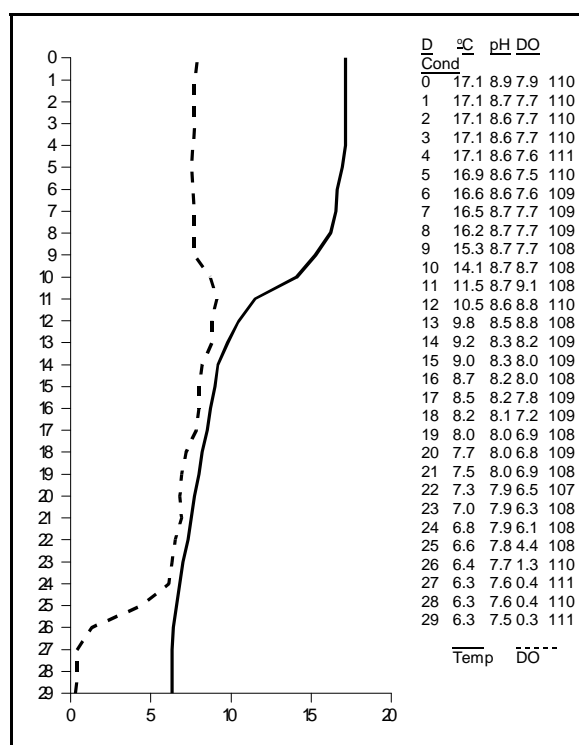
### Fish Lake.

Limnological Data			
Data averaged from STORET sites: 495485, 495486, 495487			
Surface Data	1979*	1989	1991
Trophic Status	O	M	O
Chlorophyll TSI	-	38.54	36.12
Secchi Depth TSI	30.77	26.72	29.51
Phosphorous TSI	47.35	55.10	43.44
Average TSI	39.06	40.12	36.36
Chlorophyll <i>a</i> (ug/L)	-	2.3	2.0
Transparency (m)	-	10.1	8.8
Total Phosphorous (ug/L)	7.6	34.3	15.3
pH	8.6	8.5	8.5
Total Susp. Solids (mg/L)	<5	-	<3
Total Volatile Solids (mg/L)	-	-	5
Total Residual Solids (mg/L)	-	-	<3
Temperature (°C / °f)	17/62	13/55	11/52
Conductivity (umhos.cm)	151	121	113
Water Column Data			
Ammonia (mg/L)	0.17	0.06	0.04
Nitrate/Nitrite (mg/L)	0.03	0.02	0.01
Hardness (mg/L)	49	-	43
Alkalinity (mg/L)	58	-	55
Silica (mg/L)	-	-	1.0
Total Phosphorous (ug/L)	30	72	26.7
Miscellaneous Data			
Limiting Nutrient	N	N	N
DO (Mg/l) at 75% depth	7.1	2.8	6.6
Stratification (m)	10-13	12-14	9-11
Depth at Deepest Site (m)	30	33.0	29.0
* Data from period 2 only; station 495487.			

All but brook trout are typically stocked annually. The lake has not been treated for control of fish species, therefore native populations could still exist in the lake or its tributaries. In addition the following species of fish are present in the lake: yellow perch (*Perca flavescens*), Utah sucker (*Catostomus ardens*), brown trout (*Salmo trutta*) and possible kokanee salmon (*Oncorhynchus nerka*) and mottled sculpin (*Cottus bairdisemiscuber*).

It is important to note that changes in aquatic macrophyte composition have occurred at Fish Lake through the years, thus effecting the production of invertebrate fish foods. The following were reported present in 1972; Emergents, *Myriophyllum* (abundant), *Podamogeton*, *Zanichellia* (both uncommon) and *Elodea* (uncommon); Submergents *Ceratophyllum*, *Lemna*, (both uncommon), *Nostoc*, *Aphanocapsa*. Those listed as uncomm were oncereported to be abundant, and the *Myriophyllum* as at one time only moderately common (Shirley, 1972). Presently there is an abundance of





macrophytes growth around the entire shoreline. These macrophytes tend to inhibit fishing and boating in these areas.

The lake was surveyed during the National Eutrophication Survey in 1975. They determined the reservoir to be mesotrophic. One interesting fact reported was that the retention period for the lake was calculated as

58.5 years. In view of this long retention period loadings to the reservoir should be monitored and not allowed to increase substantially shifting the eutrophic state because of the long term effect due to the long retention period.

Phytoplankton in the euphotic zone on August 22, 1991 include the following taxa (in order of dominance)

Species	Cell Volume (mm <sup>3</sup> /liter)	% Density By Volume
<i>Stephanodiscus niagarae</i>		0. 1 7 6
41.65		
<i>Merismopedia</i> sp.	0.167	39.48
<i>Peridinium cinctum</i>	0.056	13.16
<i>Microcystis incerta</i>	0.011	2.63
Pennate diatoms	0.007	1.58
Centric diatoms	0.006	1.50
Total	0.423	
Shannon-Weaver [H']	1.22	
Species Evenness	0.68	

Species Richness [d] 0.26

The flora is fairly typical, but not particularly diverse. The dominance of green algae and diatoms indicates that the lake is reasonably healthy.

### Pollution Assessment

Nonpoint pollution sources are grazing, concentrated recreation, construction, and summer home and resort activities. Cattle graze in the watershed and probably around the reservoir.

Concentrated recreation disturbs the shoreline and other areas around the lake, accelerating erosion. Litter can also be a problem.

There are no point pollution sources in the watershed.

### Beneficial Use Classification

The state beneficial use classifications include:

Information	
<b>Management Agencies</b>	
Fish Lake National Forest & Richfield Ranger	896-9233
Six County Commissioners Organization	896-9222
Division of Wildlife Resources	538-4700
Division of Water Quality	538-6146
<b>Recreation</b>	
Panoramaland Travel Region (Richfield)	896-9222
Richfield Chamber of Commerce	896-4241
Bowery Haven Resort	
May 21 - Oct. 31	836-2788
Nov. 1 - May 20	782-7378
Fish Lake Lodge/Lakeside Resort	836-2700 or 377-9750
<b>Dam Administrator</b>	
Fremont Irrigation Company	836-2843

boating and similar recreation (excluding swimming) (2B), cold water game fish and organisms in their food chain (3A) and agricultural uses (4).